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Supplementary Office Action

1. This Office Action is responsive to communication, filed on January 28th, 2010.

Claims 1 – 16 are presented for Examination;

Claims 15 and 16 are newly presented claims;

Claim Objections

2. Claims 1 and 13 have been objected for the following informalities:

"first sensor" and "second sensor" cannot be found in the specification. It appears , according to the invention, the "second sensor" may be interpreted as the measurement device, . it further appears that the "first sensor" refers to the position feedback from machine tool. Applicant is encouraged to review the language of the claims to make the terms consistent with the specification. Appropriate correction is required.

3. Claim 15 has been objected for the following informalities: the phrase "varying workpiece interaction data", as claimed in new claim 15 which depends from claim 1, can not be found in the specification. The examiner interprets the phrase as "varying measurement data concerning the workpiece as detected".

Drawing

4. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the terms, "first sensor", "second

sensor" must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Responses to Amendments & Arguments

Claim Rejections - 35 USC § 102 / 103

5. The examiner acknowledges the amendment to the claims; however, the added limitations did not overcome the combination of the references.

Locke teaches a real-time machining control system including a numerical control and a dimensional measurement system which continually measures the actual diameter of a workpiece, providing error signal representing difference between actual and programmed parameter; and the error signal is used to fine tune the process. **Locke** further teaches a calculating unit to receive signals from several different measurement devices (46, 48) to conclude an output to directly control the position of the cutting tool.

Keller, in an analogous art, teaches a method for error message diagnosis and error recovery. The error messages are stored in a database. **Keller** teaches the error message used in the method can have date and/or time stamp to improve the diagnosis of the errors; therein, time stamp is well known for denoting the date, time at which a certain event occurred, and which method can be used by **Locke** to time stamp and record the measured data concerning the workpeace and to time stamp and record the position of the machine.

Applicants amend the claims to include several limitations, the examiner respectfully responds herewith:

a. "recording 1st data representing position of the ~~machine~~ workpiece measurement device", applicants change the scope of measurement from measuring position of "machine" to a position of "workpiece"; however, in view of prior limitation "mounting a workpiece measurement

device on the machine tool", the measured positions between "machine" and workpiece" are not so different from each other which can be easily calculated by the corresponding controller.

b. "issuing time based synchronization signals", "the synchronization signals are used in the recording of the first and second data sets" and "combining data from the first and second data sets based on the synchronization signals". The examiner believe Applicants are trying to overcome **Keller**'s teaching regarding "time stamp" features; however, the languages can be read on both ways, the several synchronization signals generated at different timing used in recording different data sets; or as indicated in the background of the specification, a "Skip" function, however, in this interpretation, there lacks an essential step before generating the synchronization signals, "receiving a signal from a probe", for which the examiner further cites a reference (6,539,642 to Sei Moriyasu et al.) for teaching corresponding "Skip" technology as well as the disclosure in the background of the specification for further discussion with the Applicants.

c. "at least one first sensor", "at least one second sensor separate from the first sensor" which can not be found anywhere in the specification, drawing or prior claims; the "second sensor" may be referred to the measurement device, as indicated in specification (page 8, lines 28 – 30); the "first sensor" can not be referred to anything but a position feedback from machine tool; this terms have been temporarily given objection as indicated above; and further, if this interpretation is correct, the "synchronization signals" as discussed above will not be able to be the base for recording both first and second data sets but the second data set only, in this case, there is much less difference in applying "time stamp" in current invention.

d. "varying workpiece interaction data", as claimed in new claim 15 which depends from claim 1, cannot be found in the specification, It appears , according to the invention, , "varying workpiece interaction data", may be interpreted as "varying measurement data concerning the workpiece as detected" in claim 1, and giving 112 second paragraph for failing to further limit the independent claim.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. **Claim(s) 1 – 15 is/are rejected** under 35 U.S.C. 103(a) as being unpatentable over Dennis H. Locke et al. (U.S. Patent No. 4,974,165, and referred to as **Locke** hereinafter) in view of Lothar F. Bieg et al. (U.S. Patent No. 6,519,860, and referred to as **Bieg** hereinafter) and further in view of Gerhard Keller (U.S. P.G. Pub. 2003/0061857, and referred to as **Keller** hereinafter).

Regarding claim(s) 1, 3, 10, 13 and **15**

Locke teaches,

- A workpiece inspection system comprising a machine tool which has a controller operable to perform a workpiece producing process and a workpiece inspection process, [a real-time machining control system is provided which includes a conventional computer numerical control and a dimensional measurement system which continually measures the actual diameter of the rotating workpiece and provides an error signal representing the difference between the actual diameter of the workpiece and that of the part program. The error signal is used to directly control the movement of the cutting tool to assure the final dimentions of the workpiece, (see Abstract)]

the workpiece inspection process comprising the steps of:

- **mounting** a workpiece measurement device **on the machine tool**; [fig. 3]
- changing the position of the workpiece relative to the workpiece measurement device; [rotating workpiece, (see Abstract)]
- causing measurements of the workpiece to be recorded; [provides an error signal representing the difference between the actual diameter of the workpiece and that of the part program. The error signal is used to directly control the movement of the cutting tool to assure the final dimensions of the workpiece (see Abstract); a dimensional measuring unit 46, the out put of which is fed to calculating unit (see col. 5, lines 11 – 13)] which in particular involves:
- recording a first data set from at least one first sensor comprising varying data representing the position of the workpiece measurement device; [calculating unit also receives an input from a separate Z-axis position scale which measures the position of the cutting tool along the Z-axis (see col. 5, lines 13 – 16)] and

The examiner further explains, since the workpiece measurement device is "mounted on the machine", recording the position of the workpiece measurement device for calculating fine tune is not too different from recording machine position instead.

- recording a second data set from at least one second sensor separate from the at least one first sensor comprising varying measurement data concerning the workpiece as detected and output by the workpiece measurement device, [continually determining an actual dimension or parameter of the rotating workpiece (see col. 2, line 55 – col. 3, line 4); a dimensional measuring unit 46, the out put of which is fed to calculating unit (see col. 5, lines 11 – 13)]

Locke further teaches combining the first data set with the second data set such that each element of the two sets are associated with the same real time or synchronization signal; and outputting the combined data to a further software process which is used to refine the workpiece producing process [Calculating unit 44 is operative to process the signals fed to it. For example, it compares the information from scale 48 with a table Z-axis dimensions. If there is a match it issues a latch command to read all sensors. If there is a difference it feeds an error signal to summer 45, col. 5, lines 36 – 41];

The examiner further nodes, the calculating unit receives different data inputs from 46, 48, 49, 50 (see col. 5, lines 11 – 41 and fig. 2) then processing the signals fed to it… compares the information from 48 with a table. **If there is a match it issues a latch command** to read all sensors. If there is a difference it feeds an error signal to summer, the summer also receives inputs from 31, 42 then output a modified feedback control signal to X-axis control unit... to directly control the position of the cutting tool.

Locke does not specifically indicates synchronization signals are used in triggering the recording of the data sets and in obtaining a simultaneous data pair form first and second data set;

Bieg teaches measuring the true position of the milling head … compares the true (real) measured position with the desired, and creates a position error signal …, [(see col. 20, line 62 –

col. 21, line 17; fig. 23)], for the purpose of providing independent, real-time position feedback control of a movable machine member [col. 20, line 62 – col. 21, line 17; see more details in col. 5, lines 11 – 48];

Keller teaches synchronization signals are used in the recording of the first and second data sets such that simultaneous measurement data can be determined [With local message diagnosis units, an already existing system for data processing, such as a numeric controller, a computer-numeric controller or a storage-programmed controller can advantageously be used for the message diagnosis… Accompanying circumstances are, for example, other errors or messages which are produced simultaneously [0012]; If the error messages have additional information, such as a date and/or a time stamp, then this information can be included in the diagnosis to improve the diagnosis of the error(s) [0015]; The accompanying circumstances can be characterized by the order of the received messages and also by the time stamp of the messages provided by industrial machine or its components [0021]], for the purpose of providing a method for message diagnosis which improves error handling [Abstract].

It would have been obvious to a person of ordinary skill in the art at the time of applicant's invention to modify the teaching of **Locke** to include "recording the position of the machine", for the purpose of providing independent, real-time position feedback control of a movable machine member, col. 20 [**Bieg**, line 62 – col. 21, line 17] and "synchronization signals are used in the recording of the first and second data sets such that simultaneous measurement data can be determined", for the purpose of providing a method for message diagnosis which improves error handling [Abstract].

Regarding **claim(s) 2**, **Locke** teaches,

- the synchronisation signal issues from the controller. [feeding data defining a desired profile and dimensions of the workpiece to a computer, producing from the computer a succession of digital signals defining a succession of required cutting tool positions to machine the workpiece to that profile and dimension, continually determining an actual dimension or parameter of the rotating workpiece and deriving an error signal representing the difference between said actual dimension or parameter of the workpiece and that of the part program, and feeding the error signal to means for controlling the movement of the cutting tool to assure that the final actual machined profile and dimensions of the workpiece conform to the desired part program, col. 2, line 55 – col. 3, line 4]

Regarding **claim(s) 4**, **Locke** teaches,

- the measurement device is monitored at intervals which are more frequent than the occurrences of the said intervals and only selected data is recorded to the second set and/or the data is manipulated prior to its recording. [real-time, [real-time machining and on-machine inspection system, col. 1, lines 11 – 15; deriving an error signal representing the difference between said actual dimension or parameter of the workpiece and that of the part program, and feeding the error signal to means for controlling the movement of the cutting

tool to assure that the final actual machined profile and dimensions of the workpiece conform to the desired part program, col. 2, line 55 – col. 3, line 4]

The examiner considers "is monitored" to be "is monitoring", since the measurement device is used to monitor, not to be monitored; further, "selected data" can be the real-time monitored data.

Regarding **claim(s) 5**, **Locke** teaches,

- software for combining the data of the first and second sets. [deriving an error signal representing the difference between said actual dimension or parameter of the workpiece and that of the part program, … continually determining an actual dimension or parameter of the rotating workpiece … feeding the error signal to means for controlling the movement of the cutting tool to assure that the final actual machined profile and dimensions of the workpiece conform to the desired part program, col. 2, line 55 – col. 3, line 4]

The examiner explains, "combining" can be simply generating the error signal.

Regarding **claim(s) 6**, **Locke** teaches,

- an interface circuit which accepts the synchronisation signal and the varying data from the measurement device. [fig. 2]

Regarding **claim(s) 7**, **Locke** teaches,

- a stop signal path from the measurement device to the machine controller and the machine controller can be configured to stop the machine if a stop signal is received by the machine controller. [shut down the machine, col. 1, lines 57 – 59]

Regarding **claim(s) 8**,

Bieg teaches,

- the measurement device is a contact type dimensional measurement probe and the varying data relates to changes in the deflection of a workpiece contact stylus connected to the probe [ACMM's probe tip can be physically attached to a movable machine member (e.g. a machine tool holder, or end effector of a robotic arm) to provide independent, real-time measurement of the member's position in one, two, or three-dimensional Cartesian space, col. 7, lines 16 – 21], for the purpose of providing independent, real-time position feedback control of a movable machine member, col. 20 [line 62 – col. 21, line 17].

Regarding **claim(s) 9**, **Locke** teaches,

- the first set of data is corrected to at least reduce positional errors of the machine tool, prior to combination with the second set. [deriving an error signal representing the difference between said actual dimension or parameter of the workpiece and that of the part program, … continually determining an actual dimension or parameter of the rotating workpiece … feeding the error signal to means for controlling the movement of the cutting tool to assure that the final actual machined profile and dimensions of the workpiece conform to the desired part program, col. 2, line 55 – col. 3, line 4]

Regarding **claim(s) 11**, **Locke** teaches,

- the controller issues a further signal which enables the recording of the second set. [to continually measure the workpiece diameter in real-time and provide dimensional feedback to keep the workpiece diameter within tolerances, col. 2, lines 17 – 20]

Regarding **claim(s) 12**, **Locke** teaches,

Software for controlling a workpiece inspection system according to the steps claimed in claim 1. [part program, col. 2, lines 12 – 20]

Regarding **claim 14**, **Locke** teaches a workpiece inspection system as claimed in claim 5, wherein the system further includes

- software for influencing the workpiece producing process performed at the controller of the machine tool on the basis of the combined data [deriving an error signal representing the difference between said actual dimension or parameter of the workpiece and that of the part program, … continually determining an actual dimension or parameter of the rotating workpiece … feeding the error signal to means for controlling the movement of the cutting tool to assure that the final actual machined profile and dimensions of the workpiece conform to the desired part program, col. 2, line 55 – col. 3, line 4]

7. **Claim 16 is rejected** under 35 U.S.C. 103(a) as being unpatentable over **Locke**, **Bieg** and **Keller** and further in view of Sei Moriyasu et al. (U.S. Patent No. 6,539,642, and referred to as **Moriyasu** hereinafter).

Locke, **Bieg** and **Keller** teach a work piece inspection system as indicated above;

Locke further teaches a probe style measurement device, in the background, for well known used in machining process; (see col. 1, lines 44 – 61)

none of the references teaches the probe type sensor can generate deflection measurement of the workpiece measurement device;

however, **Moriyasu** reference has been cited for teaching a probe type sensor can generate deflection of the workpiece measurement device [probe shaft slips a distance, tilts an angle to calculate error (see col. 9, lines 12 – 58)] for analysis of slipping and tilting errors of the measnurement probe when measuring a device (see col. 8, line 48 – col. 9, line 10); based on specification:

> [0034]To avoid breakage of the probe, one or more event signals may be incorporated into the interface circuit. Should conditions occur for example deflection of the stylus greater than a threshold then the event signals are sent to the NC along line(s) 26. Such a signal will stop the machine via a conventional skip signal so that the unexpected problem can be overcome.

It would have been obvious to a person of ordinary skill in the art at the time of applicant's invention to modify the teaching of **Locke** to include "generate deflection

measurement of the workpiece measurement device", for analysis of slipping and tilting errors of the measnurement probe when measuring a device (see col. 8, line 48 – col. 9, line 10).

Conclusion

8. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Correspondence Information

9. Any inquires concerning this communication or earlier communications from the examiner should be directed to Sunray Chang, who may be reached Monday through Friday, between 6:00 a.m. and 3:00 p.m. EST. or via telephone at (571) 272-3682 or facsimile transmission (571) 273-3682 or email sunray.chang@uspto.gov.

If you need to send an Official facsimile transmission, please send it to (571) 273-8300.

If attempts to reach the examiner are unsuccessful in the regular office hour, the Examiner's Supervisor, Albert Decady, may be reached at (571) 272-3819.

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/Albert DeCady/
Supervisory Patent Examiner, Art Unit 2121

May 25, 2010
